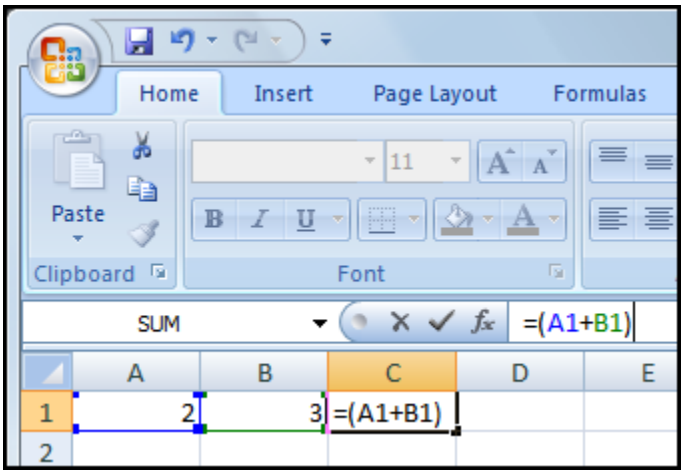
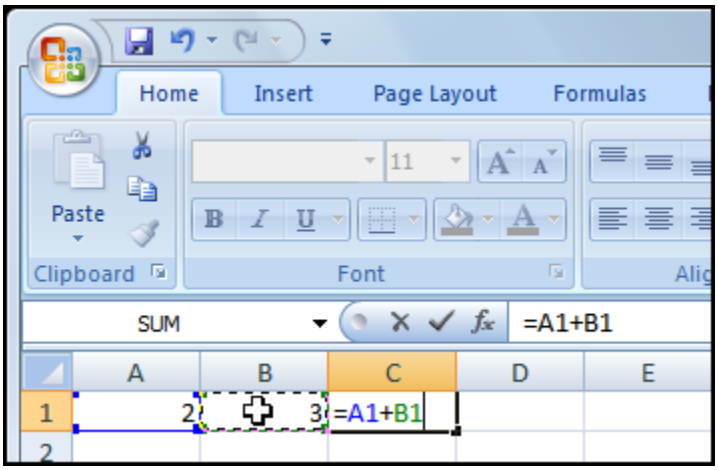
SAMLab Tip Sheet #2

Shortcuts for Performing a Particular Operation Multiple Times

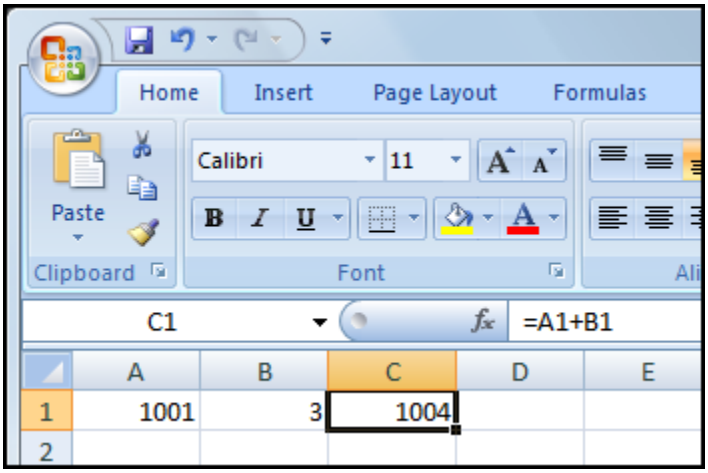
Dynamic Cell References

One of the best features of Excel is its ability to perform any particular mathematical operation multiple times with relative ease. This is very helpful with large sets of data. Excel accomplishes this task in a variety of ways but all methods involve cell references. To reference a cell (i.e., to use a cell reference), the name of a cell (e.g., A1) is put into a formula. You can do this either by typing the name of the cell into the formula (left example below) or by clicking on the cell you want to reference after beginning your new formula with an "=" character (right example below). With this later method the referenced cell will be outlined as shown.





The formula in cell C1 above references cells A1 & B1 and adds the values of cells A1 & B1. Look below for what happens when we change the value of A1. The value of C1 is automatically updated.



Notice that we say that Excel will add the values **OF** cells A1 & B1, **NOT** the values **IN** cells A1 & B1. We use this language because Excel does not care what is inside the cell. If A1 contains "=2+3" and B1 contains "=25^(1/2)", C1 in the above example becomes 10 because the values of A1 & B1 are both 5. Now that we have a basic understanding of cell references, we'll focus on just how cell references can help us make the same type of calculation multiple times.

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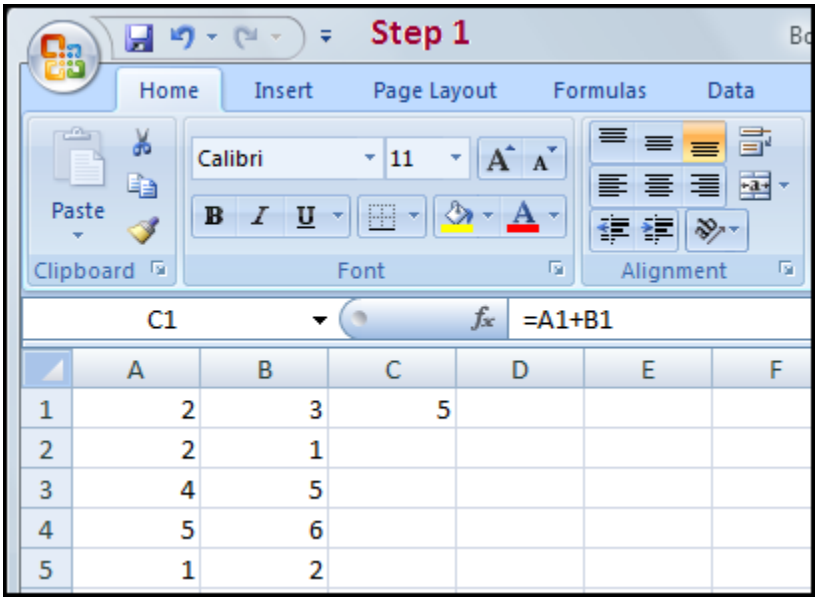
Let's say that in the example below we want to add cells A2 & B2 in C2, cells A3 & B3 in C3, and so on.



	A	B	C	D	E	F
1	2	3	5			
2	2	1				
3	4	5				
4	5	6				
5	1	2				

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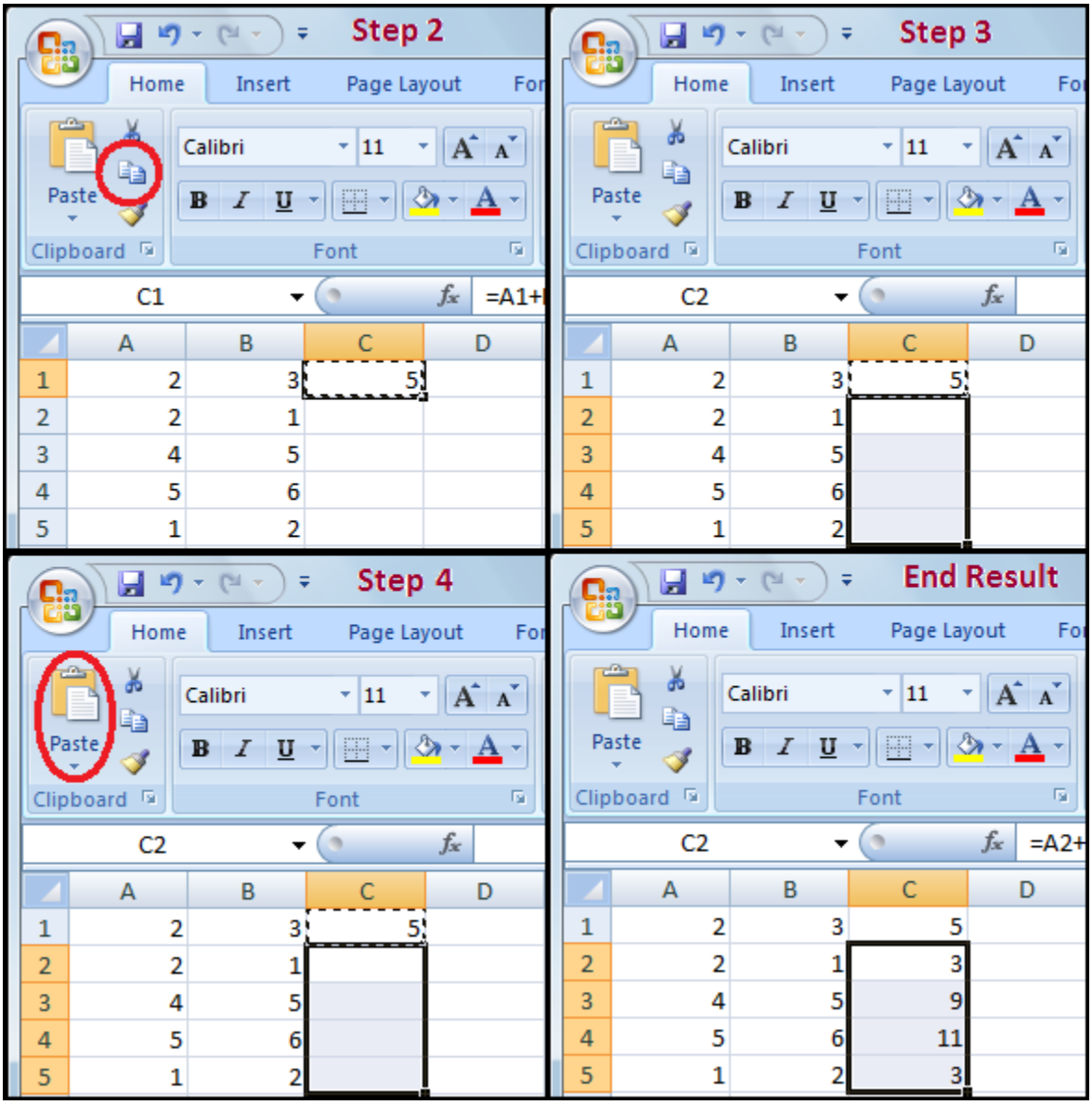
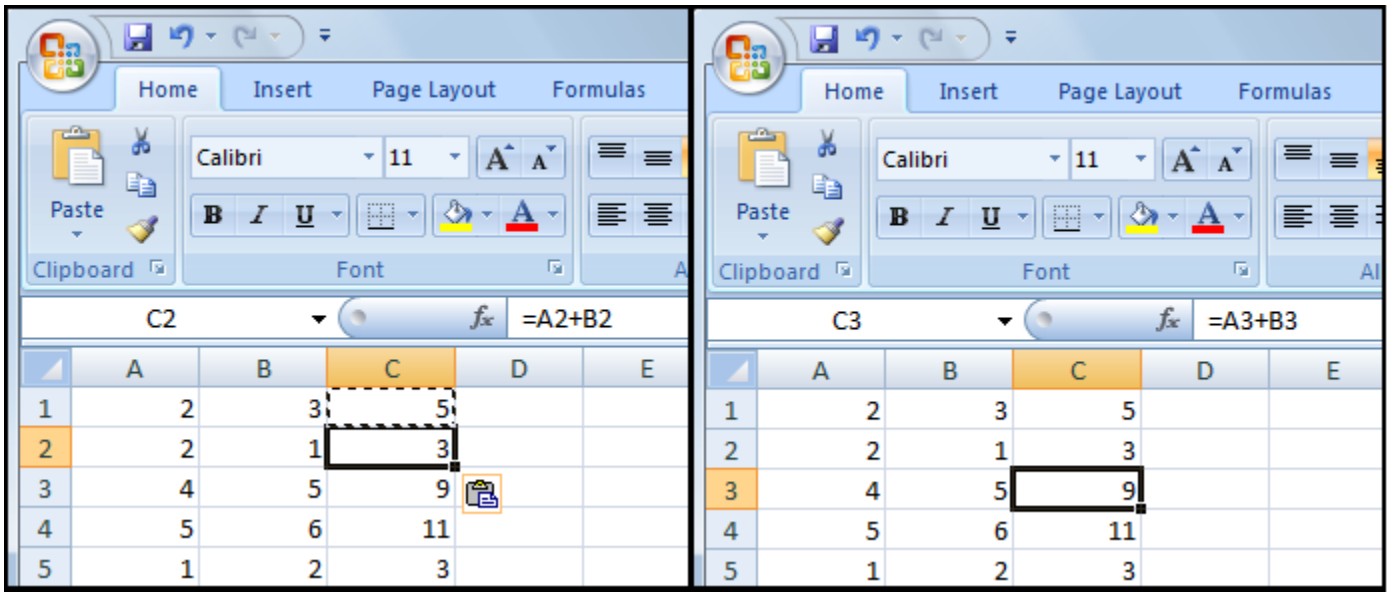
We could type the corresponding formulas in cells C2-C5, but that's unnecessary. The easier and perhaps more intuitive shortcut to our goal of multiple additions is to select cell C1 (Step 1, above), click on the "Copy" button under the "Home" tab (circled in Step 2), select cells C2 through C5 (Step 3), and click on the "Paste" button under the "Home" tab (circled in Step 4).



Now if you click on cell C2, you'll see that when Excel performed the "Paste" action, it automatically updated the cell references so that they would have the same relationship to the other "C" cells as they did in C1.



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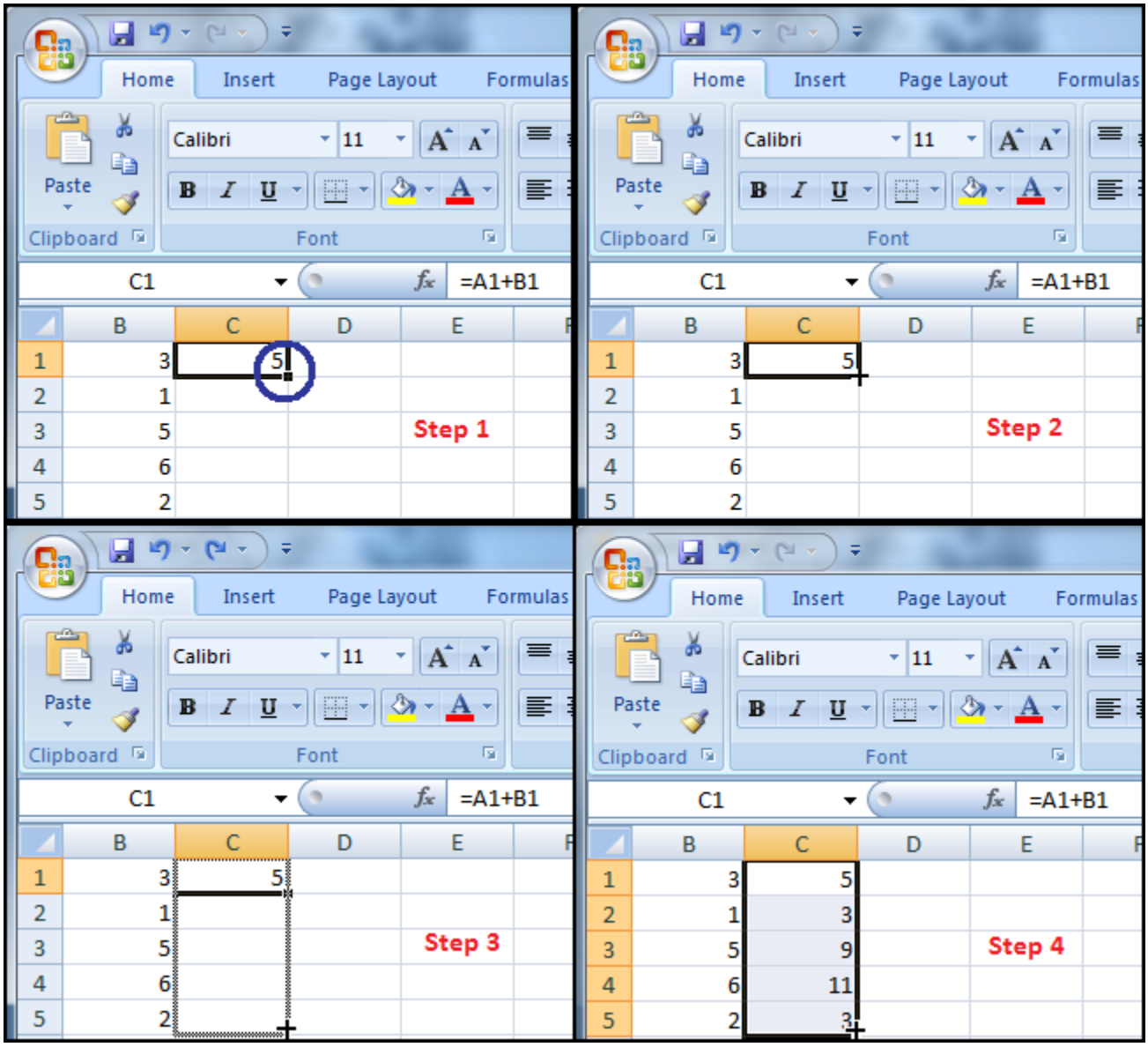
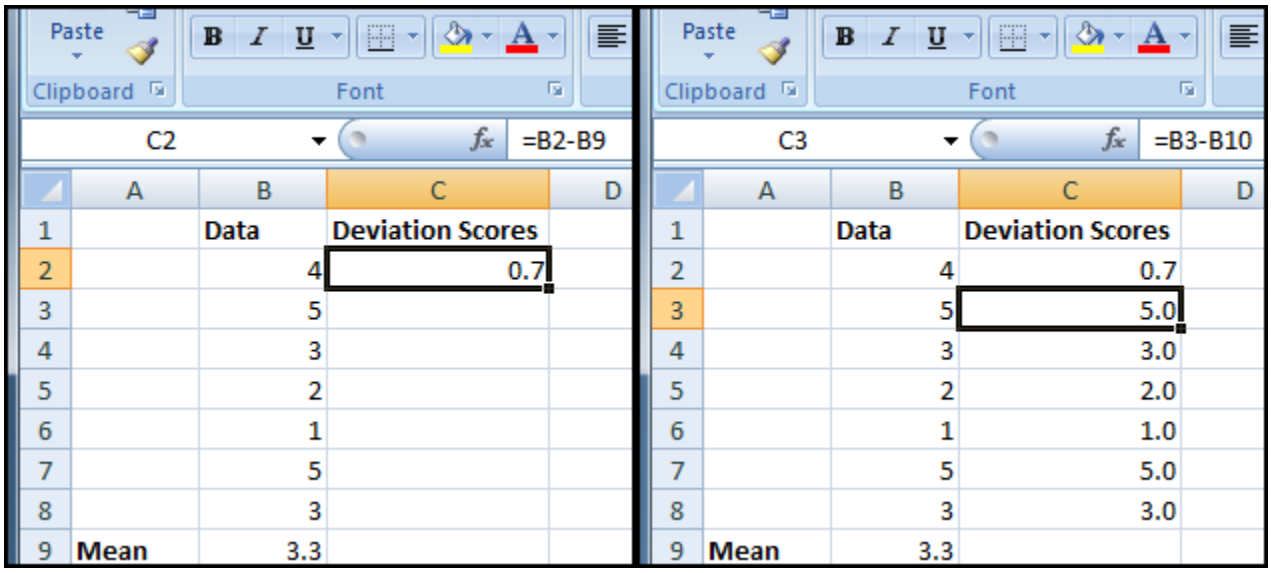
Below is another way to accomplish the same goal: you will likely find it easier and faster. Again, begin by selecting the cell that contains the formula you want to duplicate (Step 1). Notice the black box circled below. Hover your mouse over the box until your cursor resembles a black "+" (Step 2). Click and drag the box down to the lowest cell in which you wish to have your formula (Step 3) and then release the mouse (Step 4).



Again, you can click on the cells and look at the formula bar to see that the cell references have been updated appropriately. **Note that both of the above-described methods can be used with formulas much more complicated than the simple summation in this example.** We'll now switch to static cell references.

Static Cell References

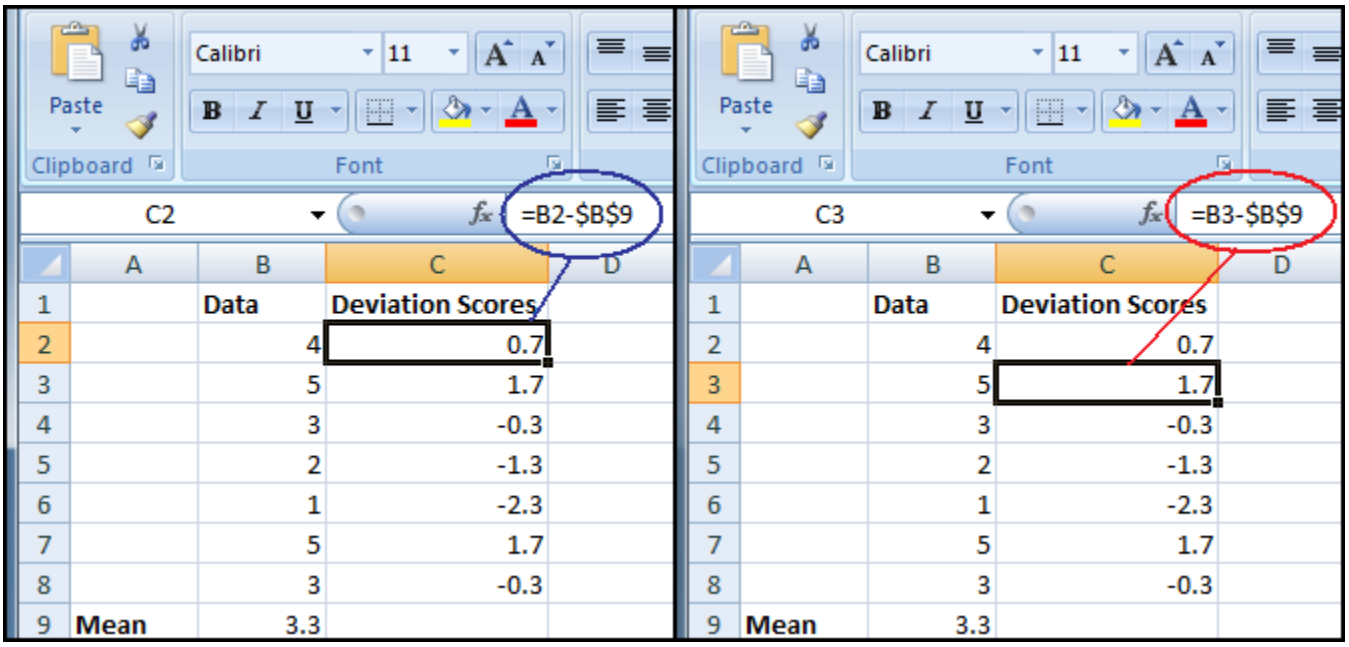
Look at the example below. Here we want to find the deviation scores (the difference between each score and the mean) for a set of data. Notice the formula we've put in cell C! and then look at formula we get in C2 after performing one of our copying methods from above. Just like before, Excel automatically updated the cell references, but this time we don't want Excel to update the second reference; it should be constant.



	A	B	C	D
1		Data	Deviation Scores	
2		4	0.7	
3		5		
4		3		
5		2		
6		1		
7		5		
8		3		
9	Mean	3.3		

	A	B	C	D
1		Data	Deviation Scores	
2		4	0.7	
3		5	5.0	
4		3	3.0	
5		2	2.0	
6		1	1.0	
7		5	5.0	
8		3	3.0	
9	Mean	3.3		

The first way to accomplish our goal of a static reference involves typing the reference in using the "$" character (blue circle), which makes the reference constant when copying the formula (red circle).



	A	B	C	D
1		Data	Deviation Scores	
2		4	0.7	
3		5	1.7	
4		3	-0.3	
5		2	-1.3	
6		1	-2.3	
7		5	1.7	
8		3	-0.3	
9	Mean	3.3		

	A	B	C	D
1		Data	Deviation Scores	
2		4	0.7	
3		5	1.7	
4		3	-0.3	
5		2	-1.3	
6		1	-2.3	
7		5	1.7	
8		3	-0.3	
9	Mean	3.3		

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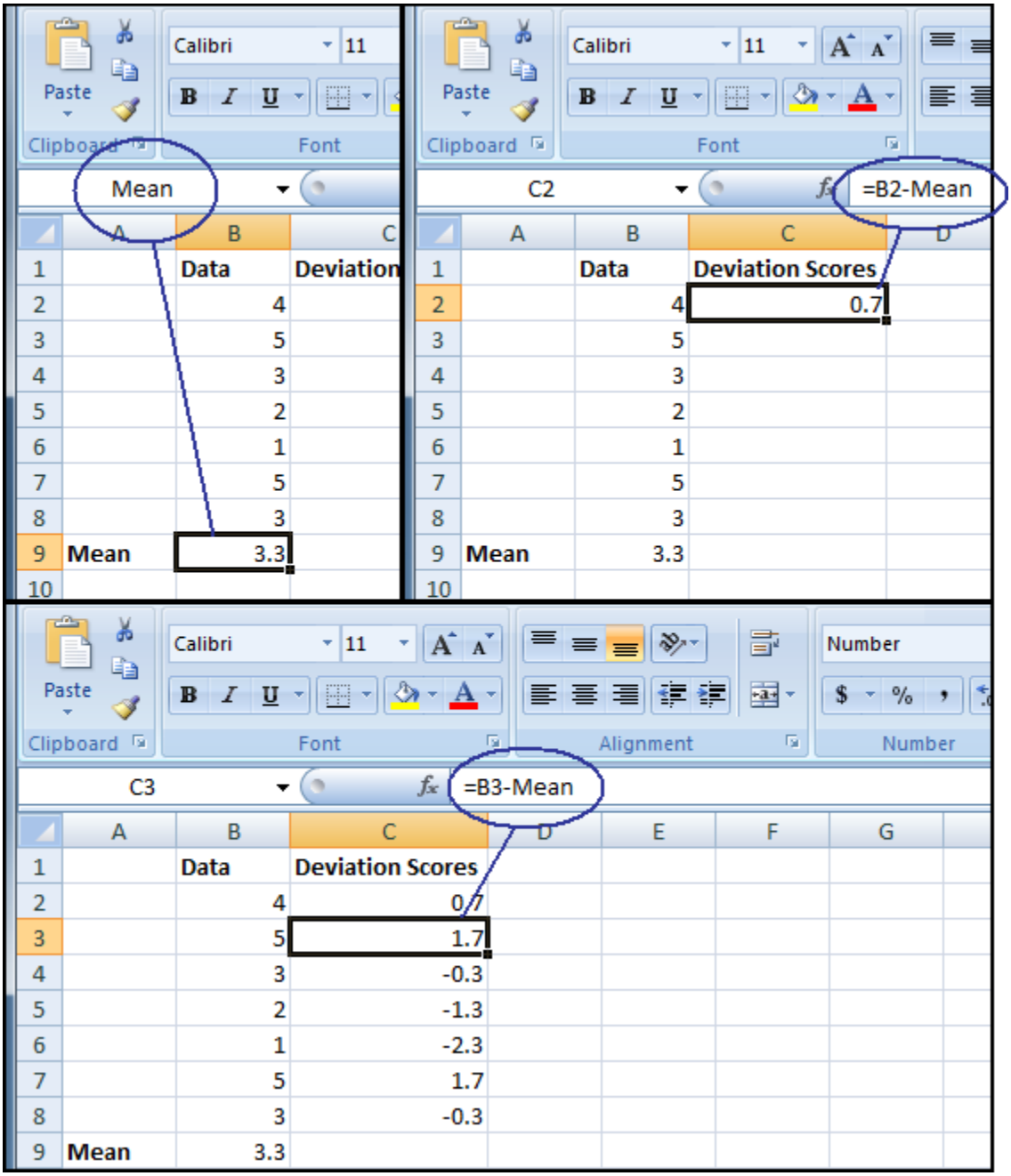
The second way to employ a static reference is to rename the referenced cell and use that name in the formula. To do this you need to first double click on the cell name box, type in a new name, and press ENTER. Next, put the cell's new name in the formula and copy the formula using one of the above-described methods.



	A	B	C
1		Data	Deviation
2		4	
3		5	
4		3	
5		2	
6		1	
7		5	
8		3	
9	Mean	3.3	
10			

	A	B	C
1		Data	Deviation Scores
2		4	0.7
3		5	
4		3	
5		2	
6		1	
7		5	
8		3	
9	Mean	3.3	
10			

	A	B	C
1		Data	Deviation Scores
2		4	0.7
3		5	1.7
4		3	-0.3
5		2	-1.3
6		1	-2.3
7		5	1.7
8		3	-0.3
9	Mean	3.3	

The methods described here certainly do not constitute an exhaustive list for how to duplicate formulas. Nevertheless, cell references will allow you to accomplish the task of duplicating a certain calculation most of the time. Neither duplication method described here is necessarily better than the other. Practice using each method to find out which one works best for you.